

WHAT IS CLAIMED IS:

1                   1.       A method for communicating a digital image over a network,  
2       comprising the steps of:  
3                   storing a digital image on a server computer;  
4                   maintaining on a client computer stored image blocks comprising portions  
5       of said digital image that have been downloaded from the server computer to the client  
6       computer;  
7                   in response to a request by a user of the client computer for a given view,  
8       comprising a particular image portion at a given resolution, performing the steps of  
9                   computing the residual area of the view resulting from subtracting out  
10      from the view the intersecting portions of stored image blocks, and, if the residual area is  
11      positive,  
12                  downloading from the server computer the residual portion of the view at  
13      the given resolution.

1                   2.       A method according to claim 1, further comprising partitioning the  
2       residual portion of the view into the minimum possible number of rectangles and  
3       downloading these rectangles from the server computer.

1                   3.       A method according to claim 2, wherein the operation of  
2       partitioning the residual portion of the view into the minimum possible number of  
3       rectangles comprises recursively executing, for the initial view and each subsequent  
4       subview, a procedure that tries to find a first stored image-block intersecting the view,  
5       and, if one is found, partitions the residual area of the view into the minimum possible  
6       number of rectangular subviews, and, if none is found, treats the entire view as a  
7       rectangle to be downloaded from the server computer.

1                   4.       A method according to claim 1, further comprising the step of  
2       displaying the given view to the user.

1                   5.       A method according to claim 1, further comprising the step of  
2       placing the downloaded image portion in the client computer's image-block cache.

1                   6.       A method according to claim 5, further comprising the step of  
2 selectively removing items from the client computer's image-block cache when the size of  
3 the cache reaches a limit.

1                   7.       A method for communicating a compressed digital image over a  
2 network, the method comprising the steps of:

3                         storing a compressed digital image, partitioned into a regular grid of  
4 compression rectangles, on a server computer;

5                         in response to a user request for a given view, comprising a particular  
6 image portion at a given resolution,

7                         constructing a virtual view, comprising the given view expanded as is  
8 minimally necessary for its boundary to correspond to an integer number of whole  
9 compression-grid tiles, and

10                        ascertaining if any image blocks in the client computer's image-block  
11 cache intersect the given virtual view, and then

12                        computing the residual area of the virtual view resulting from subtracting  
13 out from the virtual view the intersecting portions of cached image blocks, and, if the  
14 residual area is positive,

15                        downloading from the server computer a set of image compression-grid  
16 cells comprising the residual portion of the virtual view at the given resolution.

1                   8.       A method according to claim 7, further comprising partitioning the  
2 residual portion of the virtual view into the optimum number of rectangles corresponding  
3 exactly to an integer number of whole compression-grid cells, and downloading these  
4 rectangles from the server computer.

1                   9.       A method according to claim 8, wherein the operation of  
2 partitioning the residual portion of the virtual view into the optimum possible number of  
3 rectangles corresponding exactly to an integer number of whole compression-grid cells  
4 comprises recursively executing, for the initial virtual view and each subsequent subview,  
5 a procedure that tries to find a first cached image-block intersecting the view, and, if one  
6 is found, partitions the residual area of the view into the minimum possible number of  
7 rectangular subviews, and, if none is found, treats the entire view as a rectangle to be  
8 downloaded from the server computer.

1                   10.     A method according to claim 7, further comprising the step of  
2 displaying the given view to the user.

1                   11.     A method according to claim 7, further comprising the step of  
2 decompressing the downloaded image portion and placing the decompressed image  
3 portion in the client computer's image-block cache.

1                   12.     A method according to claim 7, further comprising the step of  
2 placing the downloaded compressed image portion in the client computer's compressed  
3 image-block cache.

1                   13.     A method according to claim 7, further comprising the step of  
2 selectively removing items from the client computer's image-block cache when the size of  
3 the cache reaches a limit.

1                   14.     A method according to claim 7, further comprising the step of  
2 selectively removing items from the client computer's compressed image-block cache  
3 when the size of the cache reaches a limit.

1                   15.     A method according to claim 7 comprising, if the residual area of  
2 the view is positive, and before downloading from the server computer a set of image  
3 compression-grid cells, ascertaining if any compressed image blocks from the  
4 compressed image-block cache intersect the residual area, and, if so, decompressing them  
5 and placing them in the image-block cache, and then constructing a new smaller residual  
6 area of the view formed by subtracting from the residual area of the view the areas of the  
7 image blocks that were just decompressed.

1                   16.     Apparatus for communicating a digital image over a network,  
2 comprising:  
3                   a server computer including  
4                   a database of digital images;  
5                   a server message handler, operative to receive from client computers  
6 requests for image blocks and to transmit image blocks to client computers;  
7                   a server image-block assembly processor, operative to examine the  
8 server's digital image database in order to locate a specific digital image therein, and to

9 read out of the database of digital images a set of pixels necessary to construct a specific  
10 image block; and

11 a client computer including

12 a cache of image blocks;

13 a client message handler, operative to send to the server computer requests  
14 for image blocks and to receive said image blocks from the server computer; and

15 a client main processor, operative to receive from the client computer's  
16 user a request for a particular view, comprising a particular image portion at a given  
17 resolution, to ascertain if any image blocks in the client computer's image-block cache  
18 intersect the given view, and to compute the residual area of the view resulting from  
19 subtracting out from the view the intersecting portions of cached image blocks.

1 17. Apparatus according to claim 16, further comprising apparatus on  
2 the client computer for partitioning the residual portion of the view into the minimum  
3 possible number of rectangles.

1 18. Apparatus on the client computer according to claim 16 wherein  
2 the operation of partitioning the residual portion of the view into the minimum possible  
3 number of rectangles comprises recursively executing, for the initial view and each  
4 subsequent subview, a procedure that tries to find a first cached image-block intersecting  
5 the view, and, if one is found, partitions the residual area of the view into the minimum  
6 possible number of rectangular subviews, and, if none is found, treats the entire view as a  
7 rectangle to be downloaded from the server computer.

1 19. Apparatus according to claim 16, further comprising a display  
2 device for displaying the given view to the user.

1 20. Apparatus according to claim 16, further comprising apparatus for  
2 placing the downloaded image portion in the client computer's image-block cache.

1 21. Apparatus according to claim 16, further comprising apparatus for  
2 selectively removing items from the client computer's image-block cache when the size of  
3 the cache reaches a limit.

1 22. Apparatus according to claim 16 wherein some of the digital  
2 images in the server image database are compressed into regular grids of compression

3 rectangles,, wherein the server image-block assembly processor is operative to examine  
4 the server's digital image database in order to locate a specific compressed digital image  
5 therein, and to read out of the database of digital images a set of compression grid cells  
6 necessary to construct a specific compressed image block.

1           23.     Apparatus according to claim 16 wherein the client main processor  
2 is operative to receive from the client computer's user a request for a particular view,  
3 comprising a particular image portion at a given resolution, to construct a virtual view,  
4 comprising the given view expanded as is minimally necessary for its boundary to  
5 correspond to an integer number of whole compression-grid tiles, to ascertain if any  
6 image blocks in the client computer's image-block cache intersect the given virtual view,  
7 and to compute the residual area of the virtual view resulting from subtracting out from  
8 the virtual view the intersecting portions of cached image blocks.

1           24.     Apparatus according to claim 16, further comprising, on the client  
2 computer, a cache of compressed image blocks.

1           25.     Apparatus according to claim 16, further comprising apparatus for  
2 decompressing the downloaded image portion and placing the decompressed image  
3 portion in the client computer's image-block cache.

1           26.     Apparatus according to claim 16, further comprising apparatus for  
2 placing the downloaded compressed image portion in the client computer's compressed  
3 image-block cache.

1           27.     Apparatus according to claim 16, further comprising apparatus for  
2 selectively removing items from the client computer's image-block cache when the size of  
3 the cache reaches a limit.

1           28.     Apparatus according to claim 16, further comprising apparatus for  
2 selectively removing items from the client computer's compressed image-block cache  
3 when the size of the cache reaches a limit.

1           29.     Apparatus according to claim 16 comprising apparatus operative, if  
2 the residual area of the view is positive, and before downloading from the server  
3 computer a set of image compression-grid cells, for ascertaining if any compressed image

- 4 blocks from the compressed image-block cache intersect the residual area, and, if so,  
5 decompressing them and placing them in the image-block cache, and then constructing a  
6 new smaller residual area of the view formed by subtracting from the residual area of the  
7 view the areas of the image blocks that were just decompressed.